MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210 & TERM ID 2215)

BEC2044 – ECONOMETRICS 1

(All sections / Groups)

17 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** questions in **SEVEN (7)** printed pages, including formula sheet and statistical tables.
2. Answer **ALL** questions in the answer booklet provided.
3. Marks are shown at the end of each question.

Question 1

(a) Suppose the Ministry of Housing and Local Government Malaysia decides to decrease the tax rate on residential properties under its jurisdiction. As an economic advisor to ACE Company, assess the effect of this action on the prices of residential houses using the **SIX (6)** steps in applied regression analysis.

(12 marks)

(b) Interpret whether the following statements are true, false, or uncertain and present your reasons.

(i) The stochastic error term and the residual term mean the same thing.

(2 marks)

(ii) In the linear regression model, the explanatory variable is the cause and the dependent variable is the effect. In other words, regression implies causation.

(2 marks)

(c) The following regression results were obtained for country XYZ for the period 2009 to 2022.

$$GNP_t = -787.4723 + 8.0863M_{1t} \qquad r^2 = 0.9912$$
$$se = (\quad) \quad (0.2197)$$
$$t = (-10.10001) \quad (\quad)$$

where GNP = Gross National Product (RM in billions) and M_1 = money supply (RM in billions).

(i) Compute the missing values in the blank parentheses. (4 marks)

(ii) The monetarists argue that money supply has a significant positive impact on GNP. Do you manage to reject the hypothesis that true B_2 is zero at α = 5%?

(5 marks)

[Total marks: 25 marks]

Continued...

Question 2

(a) Interpret the following terms:

(i) A best linear unbiased estimator (2 marks)

(ii) Stochastic error term (ε_i) (2 marks)

(iii) Double log model (2 marks)

(iv) Log-lin model (2 marks)

(b) Based on the data for 2008-1stQ to 2022-4thQ (n = 60), an economist obtained the following regression to explain the personal consumption expenditure (PCE) in Ethiopia.

$$\widehat{PCE_t} = -10.96 + 0.93PDI_t - 2.09INT_t$$
$$t = (-0.33)\ (1.29)\quad (-1.96) \qquad R^2 = 0.9796$$

where PCE = the PCE (RM in billions)
PDI = the disposable income (RM in billions)
INT = the interest rate (%) charged by banks

(i) Interpret the marginal propensity to consume (MPC) and find its value. (2 marks)

(ii) Assess if the MPC is statistically different from 1 at $\alpha = 1\%$. (7 marks)

(iii) Present the rationale for the inclusion of interest rate variable in the model. A priori, would you predict a negative sign for this variable? (3 marks)

(iv) Assess if β_{INT} is significantly different from zero at $\alpha = 5\%$. (5 marks)

[Total marks: 25 marks]

Continued...

Question 3

(a) Consider the following regression results:

$$\hat{Y}_t = 2.7491 + 1.1507D_t - 1.5294V_t$$
$$Se = (0.1022)\ (0.2497)\quad (0.1218)$$
$$t = (26.899)\ (4.6083)\quad (-12.5567)$$

$R^2 = 0.9680$, n = 51 quarters

where Y = Unemployment rate (%)
V = job vacancy rate (%)
D = 1, for period beginning in 2019–IV
= 0, for period before 2019–IV
t = time, measured in quarters

(i) Holding the job vacancy rate constant, compute the average unemployment rate in the period beginning in the fourth quarter of 2019. (2 marks)

(ii) Employ a test of the overall significance of the regression at $\alpha = 5\%$. (7 marks)

(b) Consider the model:

$$Y_i = B_1 + B_2X_i + B_3X_i^2 + B_4X_i^3 + \mu_i$$

where Y = the total cost of production
X = the output.

Since X^2 and X^3 are functions of X, there is perfect collinearity. Do you agree or disagree? Interpret. (4 marks)

(c) As a researcher, illustrate how you would use the **TWO (2)** detections to detect the presence of multicollinearity. (6 marks)

(d) Present any **TWO (2)** remedial measures that can be used to reduce the severity of the collinearity problem, if not to eliminate it completely. (6 marks)

[Total marks: 25 marks]

Continued...

Question 4

(a) Interpret the difference between homoscedastic and heteroscedastic error terms. (2 marks)

(b) Briefly interpret the concept and consequences of the following specification errors:

(i) Omitted variables (2 marks)

(ii) Irrelevant variables (2 marks)

(c) Consider the following double log models (standard error in parentheses):

Model 1:

$$\ln \hat{Y} = -3.96 + 0.112 \ln X_1 + 1.938 \ln X_2 + 0.114 \ln X_3$$
$$(0.148) \quad (0.130) \quad (0.052)$$

$$N = 28 \qquad \overline{R}^2 = 0.989 \qquad DW(d) = 0.23$$

Model 2:

$$\ln \hat{Y} = -5.76 + 0.21 \ln X_1 + 2.132 \ln X_2$$
$$(1.46) \quad (0.076)$$

$$N = 28 \qquad \overline{R}^2 = 0.977 \qquad DW(d) = 1.98$$

(i) Using appropriate specification criteria, assess whether X_3 is an irrelevant variable. Present your reasoning. (5 marks)

(ii) With the aid of diagrams, present a test for autocorrelation in both models using the Durbin-Watson d test at the 5 percent level. (10 marks)

(iii) If you re-estimate ***Model 1*** using Cochrane-Orcutt method, the following model obtained:

Model 3:

$$\ln \hat{Y} = 7.10 + 0.216 \ln X_1 + 0.274 \ln X_2 - 0.00016 \ln X_3$$
$$(0.134) \quad (0.428) \quad (0.054)$$

$$N = 28 \qquad \overline{R}^2 = 0.99 \qquad \hat{\rho} = 0.92$$

Assess if there is any autocorrelation problem in the model. Will you change your answer to c(i)? Interpret. (4 marks)

[Total marks: 25 marks]

End of Questions

Formula Sheet

$$\text{t - statistic} = \frac{\hat{\beta} - \beta}{\text{se}(\hat{\beta})}$$

$$\text{F - statistic} = \frac{\text{ESS}/(k)}{\text{RSS}/(n-k-1)} = \frac{R^2/(k)}{(1-R^2)/(n-k-1)}$$

$$\text{Adjusted } R^2 = 1 - (1 - R^2)\left(\frac{n-1}{n-k-1}\right)$$

$$d \approx 2(1-\hat{\rho})$$

Statistical Tables

Appendix 1: t-Table

Two tails	**0.2**	**0.1**	**0.05**	**0.02**	**0.01**
One tail	**0.1**	**0.05**	**0.025**	**0.01**	**0.005**
df					
10	1.37	1.81	2.23	2.76	3.17
20	1.33	1.72	2.09	2.53	2.84
30	1.31	1.70	2.04	2.46	2.75
40	1.30	1.68	2.02	2.42	2.70
50	1.30	1.68	2.01	2.40	2.68
60	1.30	1.67	2.00	2.39	2.66
75	1.29	1.67	1.99	2.38	2.64
100	1.29	1.66	1.98	2.36	2.63
120	1.29	1.66	1.98	2.36	2.62

Appendix 2: F-table (α=0.05)

df2\df1	1	2	3	4	5	6	7	8
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10
70	3.98	3.13	2.74	2.50	2.35	2.23	2.14	2.07
80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06
100	3.94	3.09	2.7	2.46	2.31	2.19	2.10	2.03
200	3.89	3.04	2.65	2.42	2.26	2.14	2.06	1.98
500	3.86	3.01	2.62	2.39	2.23	2.12	2.03	1.96
1000	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95

Appendix 3: Chi-square table (α=0.05)

df	$\alpha = 0.05$
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
10	18.31
20	31.41
30	43.77
40	55.76
50	67.51
100	124.34

Appendix 4: Durbin Watson d Table

Critical Values for the Durbin-Watson Statistic (d)

Level of Significance $\alpha = 0.05$

n	$k=1$		$k=2$		$k=3$		$k=4$		$k=5$	
	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
10	0.88	1.32	0.70	1.64	0.53	2.02	0.38	2.41	0.24	2.82
15	1.08	1.36	0.95	1.54	0.82	1.75	0.69	1.97	0.56	2.21
20	1.20	1.41	1.10	1.54	1.00	1.68	0.90	1.83	0.79	1.99
25	1.29	1.41	1.21	1.55	1.12	1.66	1.04	1.77	0.95	1.89
30	1.35	1.49	1.28	1.57	1.21	1.65	1.14	1.74	1.07	1.83
40	1.44	1.54	1.39	1.60	1.34	1.66	1.29	1.72	1.23	1.79
50	1.50	1.59	1.46	1.63	1.42	1.67	1.38	1.72	1.34	1.77
60	1.55	1.62	1.51	1.65	1.48	1.69	1.44	1.73	1.41	1.77
70	1.58	1.64	1.55	1.67	1.52	1.70	1.49	1.74	1.46	1.77
80	1.61	1.66	1.59	1.69	1.56	1.72	1.53	1.74	1.51	1.77
90	1.63	1.68	1.61	1.70	1.59	1.73	1.57	1.75	1.54	1.78
100	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.76	1.57	1.78
150	1.72	1.75	1.71	1.76	1.69	1.77	1.68	1.79	1.66	1.80
200	1.76	1.78	1.75	1.79	1.74	1.80	1.73	1.81	1.72	1.82

n	$k=6$		$k=7$		$k=8$		$k=9$		$k=10$	
	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
10	–	–	–	–	–	–	–	–	–	–
15	0.45	2.47	0.34	2.73	0.25	2.98	0.18	3.22	0.11	3.44
20	0.69	2.16	0.60	2.34	0.50	2.52	0.42	2.70	0.34	2.89
25	0.87	2.01	0.78	2.14	0.70	2.28	0.62	2.42	0.54	2.56
30	1.00	1.93	0.93	2.03	0.85	2.14	0.78	2.25	0.71	2.36
40	1.18	1.85	1.12	1.92	1.06	2.00	1.01	2.07	0.95	2.15
50	1.29	1.82	1.25	1.88	1.20	1.93	1.16	1.99	1.11	2.04
60	1.37	1.81	1.34	1.85	1.30	1.89	1.26	1.94	1.22	1.98
70	1.43	1.80	1.40	1.84	1.37	1.87	1.34	1.91	1.31	1.95
80	1.48	1.80	1.45	1.83	1.43	1.86	1.40	1.89	1.37	1.93
90	1.52	1.80	1.49	1.83	1.47	1.85	1.45	1.88	1.42	1.91
100	1.55	1.80	1.53	1.83	1.50	1.85	1.48	1.87	1.46	1.90
150	1.65	1.82	1.64	1.83	1.62	1.85	1.60	1.86	1.59	1.88
200	1.71	1.83	1.70	1.84	1.69	1.85	1.68	1.86	1.67	1.87

where n = number of observations and k = number of independent variables, excluding the intercept.

End of Paper